

## Two 'abnormal' clutches of Scaled Antpitta *Grallaria guatemalensis*

Published descriptions of *Grallaria* (Grallariidae) eggs are all relatively consistent, usually described as some shade of blue, with few or no markings<sup>7</sup>. Scaled Antpitta *G. guatemalensis* is no exception<sup>8</sup>, with the following published records: pale blue (nominate<sup>5,6</sup>); deep blue or 'robin's-egg blue' (*G. ochraceiventris*<sup>18</sup>; nominate<sup>19</sup>); blue-green (nominate<sup>21</sup>; ssp.?<sup>22</sup>); turquoise-blue (*G. g. regulus*<sup>3,4</sup>); or simply blue (ssp.?<sup>17</sup>). Rowley's<sup>18,19</sup> eggs were described as 'bluish' by Howell & Webb<sup>10</sup>, but equally subjective observations by HFG of photographs and museum specimens suggest that, across its range, the Scaled Antpitta lays blue eggs which may or may not vary strongly in hue. Here we describe two clutches observed *in situ* that represent the first reports of Scaled Antpittas (or any *Grallaria*) laying unpigmented eggs.

RVH found the first clutch (nominate *guatemalensis*) on 9 August 2008 at San Juan, Huazalingo, Hidalgo, Mexico (20°59'N 98°30'W; 1,260 m). Details of the nest location have been published previously<sup>25</sup>, but the eggs were not described. This clutch, of the nominate subspecies, comprised two immaculate white eggs, but no measurements were taken.

HFG found the second clutch (*G. g. regulus*) on 5 March 2014 at the Utuana Reserve of the Jocotoco Foundation, prov. Loja, Ecuador (79°45'W 04°22'S; 2,600 m). As so few nests of grallariids are described<sup>7</sup>, both the nest, and the two-egg clutch, are described below. Like the Mexican clutch described above, both eggs were immaculate white (Fig. 1). They measured 31.6 × 25.0 mm and 30.7 × 25.0 mm and weighed 10.7 g and 10.2 g, respectively. The open-cup nest was 1.6 m above ground on top of a c.45° angled log, 15 cm in diameter. It was nestled into the ample ferns and bromeliads growing on the log and, due to the angled nature of the substrate,



Figure 1. Nest and eggs of Scaled Antpitta *Grallaria guatemalensis* in south-west Ecuador showing immaculate white eggs (Harold F. Greeney)

was considerably taller at the lower end to create a level nest rim and even cup. Externally, at the lower end, the cup was 14 cm tall, but only 3.5 cm tall at the upper end. Overall external diameter was 22 cm, with the overhanging portions being supported by epiphytic vegetation. The internal measurements of the cup were 9.5 wide by 6.5 deep. The bulky cup was formed primarily of humid leaves and small sticks, with a rather loose internal cup of dark rootlets.

Apart from the white eggs, the nests described here are largely similar to those described from elsewhere in the species' range<sup>7,8</sup>. Naturalists have been puzzled by the widespread occurrence of blue-pigmented eggs across the avian phylogeny for many years, especially given their

apparent obviousness to predators. Adaptive hypotheses for blue eggs proposed in the past include thermoregulation<sup>1</sup>, aposematism<sup>23</sup>, crypsis<sup>12</sup> and egg recognition<sup>20</sup>. One relatively new hypothesis that has acquired some support, is sexual-signaling hypothesis<sup>9,15</sup>, which postulates that egg coloration is a reliable signal of female quality because the pigments responsible for blue-green shell pigments (biliverdins) are valuable antioxidants<sup>11</sup>, and only healthy females should be able to afford to include biliverdins in their eggshells during the stressful process of egg formation. The debate continues, however, and has spawned a rich literature exploring, among other aspects, the sources of dietary anti-oxidants and their effect on the deposition of biliverdins in eggshells, the

heritability of eggshell coloration, the nature of the signals that blue eggs convey to mates, and the effect of egg coloration on male parental care<sup>2,13-16,21,26</sup>. With so few clutches known for *Grallaria antipittas*, it remains to be seen if variation in blue pigmentation is more widespread than currently known, and if potential variation in the intensity of blue coloration may play a role in sexual signaling or parental care in these poorly studied Neotropical birds.

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